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Rodents (Mammalia: Rodentia) of Southwestern Syria

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Abstract. Based on field trips since 1996–2000 in southwestern Syria, a total of 19 species belonging to eight families (Sciuridae, Gliridae, Dipodidae, Cricetidae, Muridae, Hystricidae, Spalacidae and Myocastoridae) were recorded from the study area. Three taxa, *Acomys russatus lewisi* Atallah, 1967, *Apodemus flavicollis* (Melchior, 1834), and *Myocastor coypus* (Molina, 1782) were recorded for the first time to Syria.

Key words. Distribution, new records, Rodentia, *Myocastor coypus*, Syria, Mediterranean, Palearctic region.

INTRODUCTION

Southern Syria is a transitional zone between the moist and arid Mediterranean climate. Two major landmarks are located in southwestern Syria; Mount Hermon mountain series and Jabal Al Arab. Mount Hermon, known in Arabic as „*Jabal Al Shaikh*", consists of a series of mountain cluster forming the anti-Lebanon mountain range. Its highest altitude reaches up to 1814 m a. s. l. Jabal Al Arab is a volcanic formation that arises from over 100 volcanos during the lower-Pleistocene to the Holocene. Average elevation is about 1000 m a. s. l, with highest peak reaching 1800 m a. s. l. Rain fall reaches 553 mm annually, with occasional snow fall. To the east, the Syrian Desert borders the southern and eastern side of Syria (Atallah 1977).

The mammals of Syria were studied since the early 1930's. Aharoni (1932) reported on the rodents of Syria including the collection of living Syrian Hamster. Other studies included records of rodents from Syria and Lebanon (von Lehman 1965, Kumerloeve 1975). Rodents of Syria were studied extensively based on owl pellets (Kock & Nader 1983, Kock et al. 1994, Kock 1998, Shehab et al. 1999, Shehab et al. 2000, Obuch 2001, Hutterer & Kock 2002, Shehab 2005). Species accounts on some rodents of Syria were published by Shehab et al. (1999, 2003 and 2009). This study documents rodent's collection from southwestern Syria, with notes on their ecology.

MATERIAL AND METHODS

The present study is based on field studies since 1996–2010 along with the senior author. Rodents were trapped using Sherman folding live-traps (23×9×9 cm), traps were baited with mixed oatmeal and peanut butter. Traps were set in the late afternoon and checked in the early morning hours. Owl pellets were collected from different localities and analyzed for rodent's skull remains, they were identified to species level based on skull morphology and dental features. Collected materials were kept at the General Commission for Scientific Agricultural Research, Duma, Syria. Scientific names and nomenclature were followed as in Wilson & Reeder (2005).

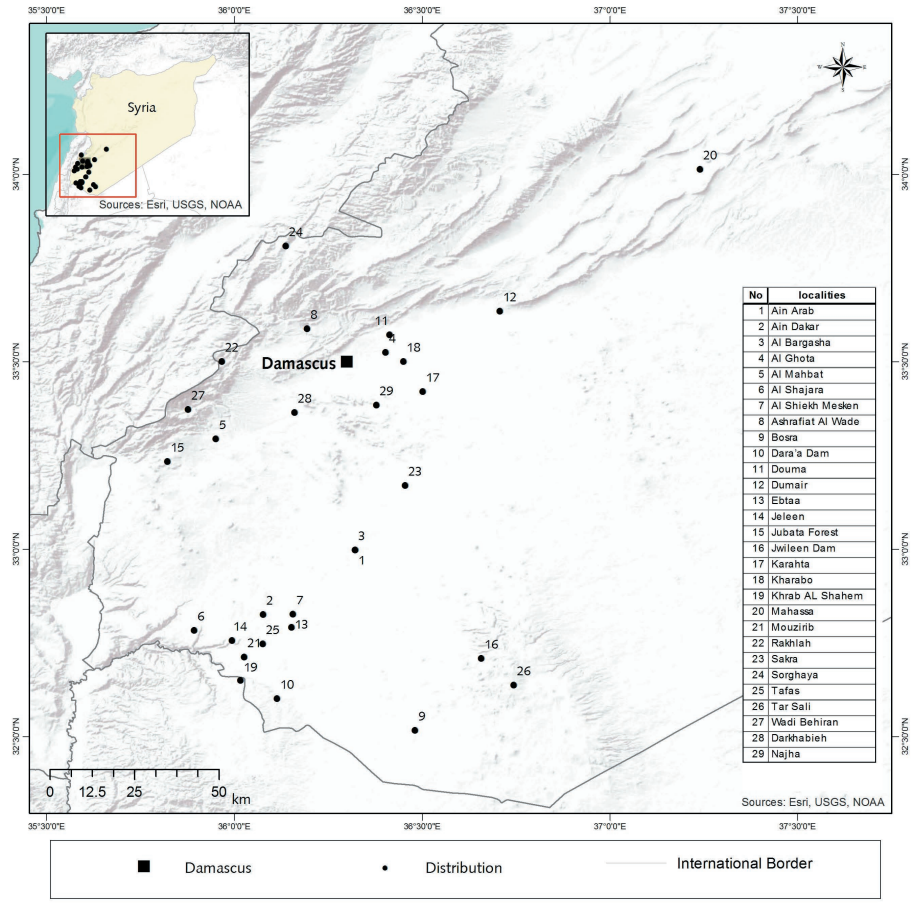
* Adwan Shehab was killed in the Syrian War on 16 February 2015.

A total of 29 localities were visited in southwestern Syria around Jabal Al Araba and Mount Hermon, the vicinity of Damascus and as far as eastern Damascus to Palmyra highway (see Fig. 1 and Annex).

Abbreviations. BL = body length, HB = head and body, TaL = tail; HF = hind foot; EL = ear; Wt = weight; GtL = greatest length of skull; ZB = zygomatic breadth; IC = interorbital constriction; BB = braincase breadth; BD = brain case depth; NL= nasal length; Dia = diastema; ForI = foramen incisivum; HS = height of skull; MXC = maxillary cheekteeth; MDC = mandibular cheekteeth; ML = mandible length (incisor included); MB = mandible body (incisor not included); TB = tympanic bulla; min = minimum; max = maximum; M = mean; SD = standard deviation; n = number of specimens.

RESULTS

A total of 19 species belonging to eight families (Sciuridae, Gliridae, Dipodidae, Cricetidae, Muridae, Hystricidae, Spalacidae, and Myocastoridae) were recorded from the study area. Three species; *Acomys russatus lewisi* Atallah, 1967, *Apodemus flavicollis* (Melchior, 1834), and *Myocastor coypus* (Molina, 1782) were recorded for the first time to Syria.



No	localities
1	Ain Arab
2	Ain Dakar
3	Al Bargasha
4	Al Ghota
5	Al Mahbat
6	Al Shajara
7	Al Shiekh Mesken
8	Ashrafiat Al Wade
9	Bosra
10	Dara'a Dam
11	Douma
12	Dumair
13	Ebtaa
14	Jeleen
15	Jubata Forest
16	Jwileen Dam
17	Karahta
18	Kharabo
19	Khrab AL Shahem
20	Mahassa
21	Mouzirib
22	Rakhlah
23	Sakra
24	Sorghaya
25	Tafas
26	Tar Sali
27	Wadi Behiran
28	Darkhabieh
29	Najha

Fig. 1. Map of southwestern Syria showing studied localities.

Table 1. Body and cranial measurements (in mm) of *Sciurus anomalus* Gmelin, 1778

measurements	n	min	max	M	SD
BL	4	195	210	200.0	7.07
TaL	4	130	160	146.3	12.50
HF	4	55	55	55.0	0.00
E	4	28	29	28.5	0.58
GtL	4	49.90	51.00	50.41	0.48
ZB	4	28.60	30.26	29.66	0.74
IC	4	16.40	17.54	16.80	0.65
BB	4	21.82	22.28	22.07	0.20
BD	4	18.00	18.94	18.37	0.40
NL	4	16.18	18.70	17.01	1.14
Dia	4	11.40	12.42	11.95	0.47
HS	4	11.80	12.90	12.39	0.51
MXC	4	9.22	8.86	9.22	0.47
MDC	4	9.12	9.84	9.51	0.31
ML	4	33.38	34.12	33.90	0.35
MB	4	29.42	29.46	29.44	0.02

Family Sciuridae

Sciurus anomalus Gmelin, 1778

Material examined. 4 specimens, Al Ghota, 1996.

Remarks. The Persian Squirrel is the only representative of family Sciuridae in the Middle East. The ecology of this species was studied in detail in Jordan and Lebanon (Amr et al. 2006, Abi-Said et al. 2014). In Syria, this species was noted from Mount Hermon and near wooded areas near Damascus (Tristram 1866, Harrison & Bates 1991, Gavish 1993). Other records are from northern Syria including Kastel Maaf, Slenfeh and Furlunlock forests (von Lehman 1965). The Persian Squirrel is sold in pet shops in Damascus, and it is probably trapped from areas near Mount Hermon. It is also exported illegally abroad to Jordan and Lebanon, especially at the time of the Syrian War. We examined four specimens collected from Ghota area, near Damascus. This locality is dominated by fruit and almond trees. Verbal records from south of Mount Hermon and Rakhal indicate its presence. Table 1 shows body and cranial measurements for collected specimens. Skull morphology is illustrated in Fig. 2.

Family Gliridae

Eliomys melanurus (Wagner, 1839)

(Fig. 3A)

Material examined. GCSAR1939, ♀, Al Bargasha, 24 May 2010. GCSAR1944, ♀, Al Bargasha, 24 May 2010. GCSAR1945, ♂, Al Bargasha, 24 May 2010. GCSAR1987, ♂, Al Bargasha, 24 May 2010. GCSAR1993, ♀, Al Bargasha, 3 June 2010. GCSAR2014, ♀, Al Bargasha, 3 June 2010.
Specimens recovered from owl pellets. 1 skull, ex. *Strix aluco*, Sorghaya, 15 June 2004.

Remarks. Kahmaan (1981) listed several localities of this species in Syria (Mt. Hermon, Golan Heights, Birket Bab el-Haoua, and Ein Qunya). It was also reported from Damascus (Golemansky & Darwish 1993), Halabiye (Kryštufek & Kraft 1997) and Halabiye, Palmyra and Yabrud (Obuch

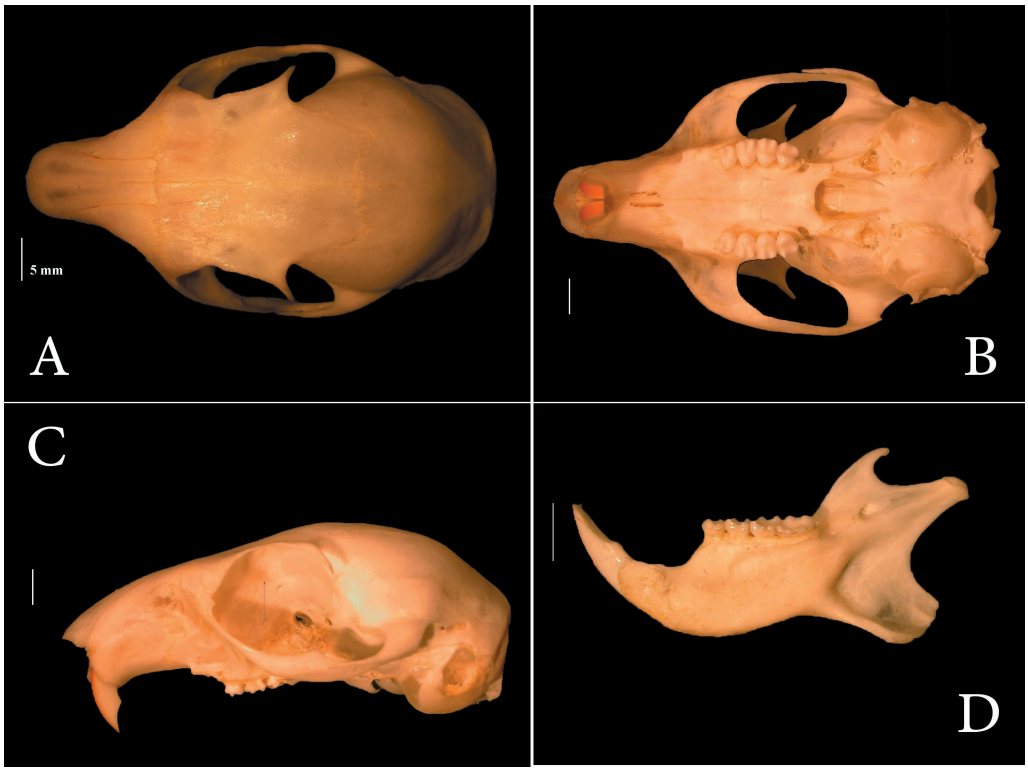


Fig. 2. Skull of *Sciurus anomalus* Gmelin, 1778 (scale bar = 5 mm). A. Dorsal view. B. Ventral view. C. Lateral view. D. Lower jaw.

2001). The most eastern distribution range reaches SW Qal'aat Sukkara near Jebel Abd al-Aziz (Shehab et al. 2004). Shehab et al. (2009) gave a comprehensive account on skull morphology, phallus and baculum, along with a detailed distribution map for *E. melanurus*. Together with its preferred arid, rocky habitat, *E. melanurus* is probably more widely distributed in Syria than is documented at present. Table 2 gives some body measurements for *E. melanurus*.

***Dryomys nitedula* (Pallas, 1778)**

Material examined. 7 specimens, Ashrafiat Al Wade, 2003.
Specimens recovered from owl pellets. 5 skulls, ex. *Tyto alba*, Kharabo, 25 June 2000.

Remarks. The Forest Dormouse is a forest-inhabiting rodent. In Syria, it occurs in agricultural areas with dense walnut trees, especially along Barda basin. It is quite common along coastal evergreen forests and orchards. These forests are dominated by evergreen oak (*Quercus callipinos* Webb, 1838) and pistachio trees. *Dryomys nitedula* shares its habitat with the Black Rat, *Rattus rattus*, where this species was trapped more than once by the same traps installed over the rural roofs.

The only record for its presence in Syria was that mentioned by von Lehman (1965) from Kastel Maaf and Slenfe in the coastal region. Shehab et al. (2003) gave additional localities in southern

Table 2. Body measurements (in mm) of *Eliomys melanurus* (Wagner, 1839)

	♀♀ (n=4)			♂♂ (n=2)		
	min	max	M	min	max	M
TL	220	234	227.25	220	237	228.5
TaL	105	115	110.50	110	115	112.5
HF	25	26	25.50	26	26.5	26.25
EL	25	28	26.75	25	26	25.5
Wt	40	52	45.13	37.4	59.7	48.55

Syria and around Homs. The Forest Dormouse, *D. nitedula*, is a Palaearctic rodent reaching its most southern range of distribution into Syria and Palestine. Its distribution in Syria is confined to the coastal forests from Latakia to Mesieaf and Marmarita near Homs and Hama and into Barda River basin. In Palestine, its occurrence is confined to the upper Galilee mountains (Nevo & Amir 1964). Its presence in Lebanon was confirmed by Abi-Said & Kryštufek (2012).

Family Dipodidae

Allactaga euphratica Thomas, 1881
(Fig. 3B)

Material examined. GCSAR1962, ♀, Najha, 7 June 2010.
Body measurements. TL: 304, TaL: 185, HF: 54, EL: 35, W: 76.2 g.

Remarks. This is a common species in northern Syria and around the deserts of Palmyra (Misonne 1957, Atallah & Harrison 1968, Kock & Nader 1983). This record represents the most western

Table 3. External, cranial and dental measurements (in mm) of adult specimens of *Dryomys nitedula* collected at Ashrafiet Al Wadi, Syria

measurements	n	min	max	M	SD
HB	7	81	117	97.57	15.57
TaL	7	92	95	93.40	1.14
HF	7	18	24	20.76	1.99
EL	7	13	15	13.77	0.65
GtL	6	26.12	28.08	27.03	0.82
ZB	6	14.50	16.14	15.23	0.54
IC	6	3.74	4.00	3.88	0.10
BB	6	12.46	13.38	12.92	0.36
BD	5	10.42	10.78	10.58	0.14
NL	6	8.22	8.90	8.45	0.26
Dia	6	6.22	6.68	6.46	0.19
ForI	6	2.46	3.40	3.09	0.32
HS	5	5.56	5.88	5.79	0.13
MXC	6	3.60	4.00	3.79	0.15
MDC	6	3.64	4.08	3.89	0.18
ML	6	15.88	16.68	16.38	0.28
MB	5	13.34	14.32	13.89	0.40
TB	5	9.48	9.92	9.72	0.19

distribution range for *A. euphratica* in Syria. It was recorded from two localities in north Lebanon (Abi-Said 2004). Skull morphology is illustrated in Fig. 4.

***Jaculus jaculus* (Linnaeus, 1758)**
(Fig. 3C)

Material examined. Mahasa, 18 May 2010.

Remarks. This species was recorded from several localities to the east and northern arid regions of Syria (Atallah 1978, Nadachowski et al. 1990). Shehab et al. (2004) listed a number of localities along the Euphrates based on cranial remains recovered from owl pellets.

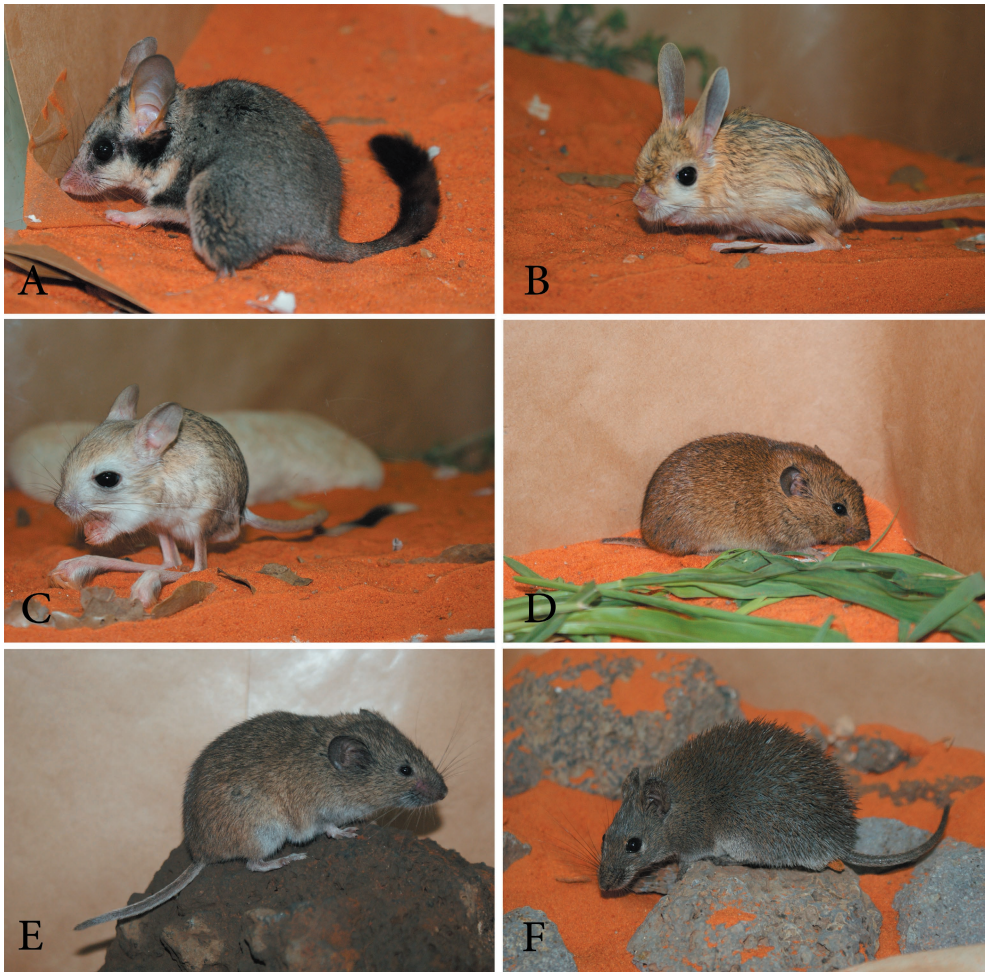


Fig. 3. A. *Eliomys melanurus* (Wagner, 1839) from Al Bargasha. B. *Allactaga euphratica* Thomas, 1881 from Najha. C. *Jaculus jaculus* (Linnaeus, 1758) from Mahasa. D. *Microtus guentheri* (Danford et Alston, 1880) from Ain Arab. E. *Chionomys nivalis* (Martins, 1842) from Tar Sali. F. *Acomys russatus lewisi* Atallah, 1967 from Al Bargasha.

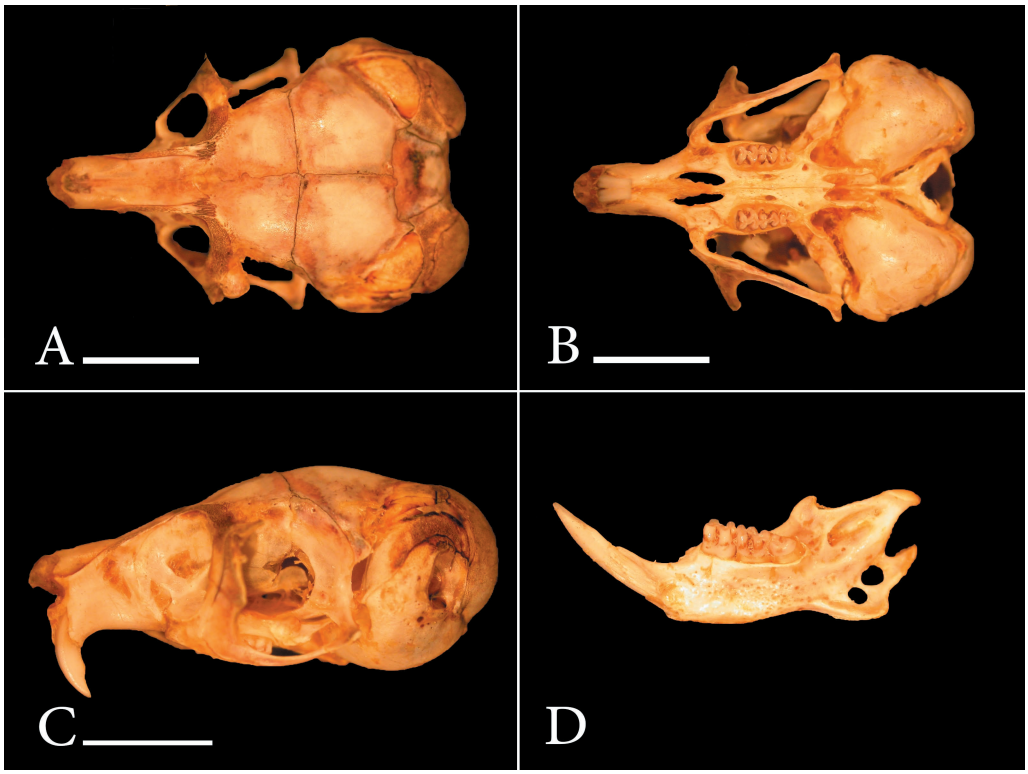


Fig. 4. Skull of *Allactaga euphratica* Thomas, 1881 (scale bar = 10 mm). A. Dorsal view. B. Ventral view. C. Lateral view. D. Lower jaw.

Family Cricetidae

Cricetulus migratorius cinerascens (Wagner, 1848)

Specimens recovered from owl pellets. 13 skulls, ex. *Tyto alba*, Khrab AL Shaham, 16 May 2000. 6 skulls, ex. *Tyto alba*, Sorghaya, 24 June 2000. 23 skulls, ex. *Tyto alba*, Mouzirib, 15 July 2000. 1 skull, ex. *Tyto alba*, Sorghaya, 2 January 2001. 21 skulls, ex. *Tyto alba*, Sorghaya, 3 April 2001. 4 skulls, ex. *Tyto alba*, Sorghaya, 24 July 2001. 3 skulls, ex. *Tyto alba*, Mouzirib, 25 July 2001. 1 skull, ex. *Tyto alba*, Mouzirib, 9 October 2001. 4 skulls, ex. *Tyto alba*, Dara'a Dam, 17 November 2001. 1 skull, ex. *Tyto alba*, Mouzirib, 26 April 2004. 5 skulls, ex. *Tyto alba*, Mouzirib, 27 April 2004. 15 skulls, ex. *Tyto alba*, Sorghaya, 15 June 2004. 19 skulls, ex. *Tyto alba*, Dara'a Dam, 2 October 2004. 8 skulls, ex. *Tyto alba*, Kharabo, 18 July 2005. 6 skulls, ex. *Tyto alba*, Bosra, 17 August 2006. 6 skulls, ex. *Tyto alba*, Karahta, 19 February 2007. 4 skulls, ex. *Tyto alba*, Kharabo, 19 April 2007. 2 skulls, ex. *Tyto alba*, Sorghaya, 18 May 2010. 8 skulls, ex. *Tyto alba*, Karahta, 19 May 2010. 180 skulls, ex. *Tyto alba*, Al Shiekh Mesken, 1 November 2010. 1 skull, ex. *Tyto alba*, Ain Dakar, 1 November 2010. 1 skull, ex. *Tyto alba*, Mouzirib, 1 December 2010. 3 skulls, ex. *Tyto alba*, Tafas, 1 December 2010. 79 skulls, ex. *Tyto alba*, Ebtaa, 1 December 2010.

Remarks. Despite the fact that no alive specimens were trapped during this study, the Grey Hamster seems to be quite common. All collected materials were recovered from owl pellets. The localities indicated are mostly agricultural fields for wheat and other vegetable crops. It was reported in owl pellets from Qal'aat al-Hosson, Ebla, ar'Rasafeh and southern Syria (Pradel 1981, Shehab 2005, Shehab et al. 2004).

Table 4. Body measurements (in mm) of *Microtus guentheri* (Danford et Alston, 1880)

	♀♀ (n=6)			♂♂ (n=5)		
	min	max	M	min	max	M
TL	118	146	133.33	132	150	137.4
TaL	20	32	23.25	25	29.5	27.10
HF	15	18	16.61	17	21	19.30
EL	10.5	13.8	11.80	11.5	15.0	12.70
Wt	19.3	41.5	31.57	27.4	42.0	34.88

Microtus guentheri (Danford et Alston, 1880)
(Fig. 3D)

Material examined. GCSAR1801, 1803, 2 ♂♂, Ain Arab, 18 August 2006. GCSAR1930, ♂, Al Shajara, 26 May 2010. GCSAR1931, ♀, Al Shajara, 26 May 2010. GCSAR1933, ♂, Jwileen Dam, 24 May 2010. GCSAR1934, ♂, Jwileen Dam. GCSAR1937, 1938, 2 ♀♀, Ain Arab, 25 May 2010. GCSAR1990, ♂, Ain Arab, 14 June 2010. GCSAR2008, ♀, Ain Arab, 14 June 2010. GCSAR2114, 2115, 2 ♀♀, Tar Sali, 20.11.2010.

Specimens recovered from owl pellets. 17 skulls, ex. *Tyto alba*, Darkhabieh, 24 March 1998. 8 skulls, ex. *Tyto alba*, Khrab Al Shaham, 16 May 2000. 41 skulls, ex. *Tyto alba*, Mouzirib, 15 July 2000. 2 skulls, ex. *Tyto alba*, Mouzirib, 24 September 2000. 27 skulls, ex. *Tyto alba*, Sorghaya, 3 April 2001. 5 skulls, ex. *Tyto alba*, Sorghaya, 24 July 2001. 49 skulls, ex. *Tyto alba*, Mouzirib, 25 July 2001. 32 skulls, ex. *Tyto alba*, Mouzirib, 9 October 2001. 30 skulls, ex. *Tyto alba*, Mouzirib, 27 April 2004. 83 skulls, ex. *Tyto alba*, Sorghaya, 15 June 2004. 9 skulls, ex. *Tyto alba*, Dara'a Dam, 2 October 2004. 30 skulls, ex. *Tyto alba*, Karahta, 19 February 2007. 92 skulls, ex. *Tyto alba*, Sorghaya, 6 June 2007. 40 skulls, ex. *Tyto alba*, Sorghaya, 18 May 2010. 76 skulls, ex. *Tyto alba*, Karahta, 19 May 2010. 9 skulls, ex. *Tyto alba*, Kharabo, 25 June 2010. 964 skulls, ex. *Tyto alba*, Al Shiekh Mesken, 1 November 2010. 3 skulls, ex. *Tyto alba*, Dara'a Dam, 17 November 2010. 221 skulls, ex. *Tyto alba*, Ebtaa, 1 December 2010. 28 skulls, ex. *Tyto alba*, Tafas, 1 December 2010. 14 skulls, ex. *Tyto alba*, Mouzirib, 1 December 2010. 47 skulls, ex. *Tyto alba*, Jeleen, 1 December 2010.

Remarks. The Social Vole is a common species in agricultural open meadows. It is associated with loose *terra rosa* soil and avoids rocky areas. Some specimens were collected from altitudes reaching 1900 m a. s. l. at Ain Al Arous, Mount Hermon. It seems that the Social Vole is one of the preferred food items consumed by the Barn Owl, *Tyto alba*. Table 4 shows some body measurements for *M. guentheri.*

Chionomys nivalis (Martins, 1842)
(Fig. 3E)

Material examined. GCSAR1802, ♀, Ain Arab, 18 August 2006. GCSAR1989, ♀, Ain Arab, 14 June 2010. GCSAR2116, ♀, Tar Sali, 20 November 2010. ASC79–81, 3 ♂♂, Al Mahbat, 14 August 1996.

Measurements. GCSAR1802 (TL; 172, TaL: 54, HF: 20.6, EL: 13.5, Wt: 41), GCSAR1989 (TL; 192, TaL: 60, HF: 22, EL: 16, Wt: 48.2), GCSAR2116 (TL; 175, TaL: 55, HF: 21, EL:14.5, Wt: 43).

Remarks. This species has a wide range of distribution extending from south-western Europe through south-eastern Europe to the Caucasus, Turkey reaching as far as Syria and northern Palestine as its most southern range (Shenbrot & Krasnov 2005). Kafrun is the only known locality for the Snow Vole in Syria (Aharoni 1932). It has been recorded from several localities in Lebanon (Lewis et al. 1967, Harrison 1972). The present record represents the second locality for Syria. Tar Sali is about 1680 m asl in the center of Jabal Al Arab, with cleared forests of the Azarole Hawthorn, *Crataegus azarolus*, and the Palestine Oak*, Quercus calliprinos.* Specimens were trapped near stone walls (Fig. 5). It was found in association with *Microtus guentheri*, *Apodemus mystacinus* and *Meriones trestrami*. In Al Mahbat, located in Mount Hermon, the Snow Vole was more common. This is rocky area with scattered vegetation. Skull morphology is illustrated in Fig. 6.

Fig. 5. Habitat of *Chionomys nivalis* (Martins, 1842) at Tar Sali.

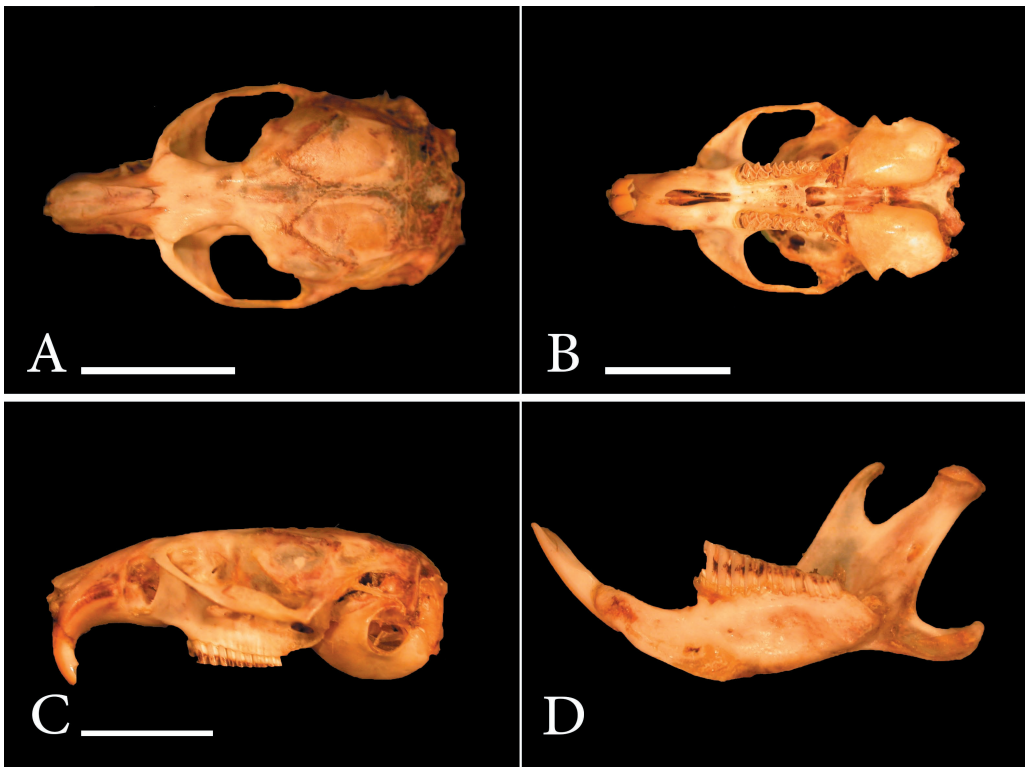


Fig. 6. Skull of *Chionomys nivalis* (Martins, 1842) (scale bar = 10 mm). A. Dorsal view. B. Ventral view. C. Lateral view. D. Lower jaw.

Family Muridae

***Acomys russatus lewisi* Atallah, 1967**
(Fig. 3F)

Material examined. GCSAR1943, ♂, Al Bargasha, 24 May 2010. GCSAR1979, ♀, Al Bargasha, 3 June 2010. GCSAR2057, ♀, Al Bargasha, 24 May 2010. GCSAR2060, 2061, 2 ♂♂, Al Bargasha, 24 May 2010. GCSAR2075, 2076, 2 ♂♂, Sakra, 7 July 2010. GCSAR2077, ♂, Al Bargasha, 24 May 2010. GCSAR2078, ♀, Al Bargasha, 24 May 2010. GCSAR2083, ♂, Al Bargasha, 7 July 2010. GCSAR2084, ♀, Al Bargasha, 7 July 2010. GCSAR2087–2089, 3 ♂♂, Al Bargasha, 7 July 2010. GCSAR2090, ♀, Al Bargasha, 7 July 2010.

Remarks. The present record is the first for Syria proper. This subspecies is confined to the black lava desert of eastern Jordan. It occupies rocky areas around Azraq and extends throughout the black lava desert into to the southern slopes of Jabal Al Arab and northern Saudi Arabia (Amr et al. 2018). Both localities are characterized by the presence of terraces with black lava rocks. Bates (1994) considered the species *lewisi* as a synonym for *A. russatus*. *Acomys russatus lewisi* is darker in colour and apparently is confined to the black lava deserts of Jordan (Atallah 1978, Searight 1987). Skull morphology is illustrated in Fig. 7. Body measurement are given in Table 5.

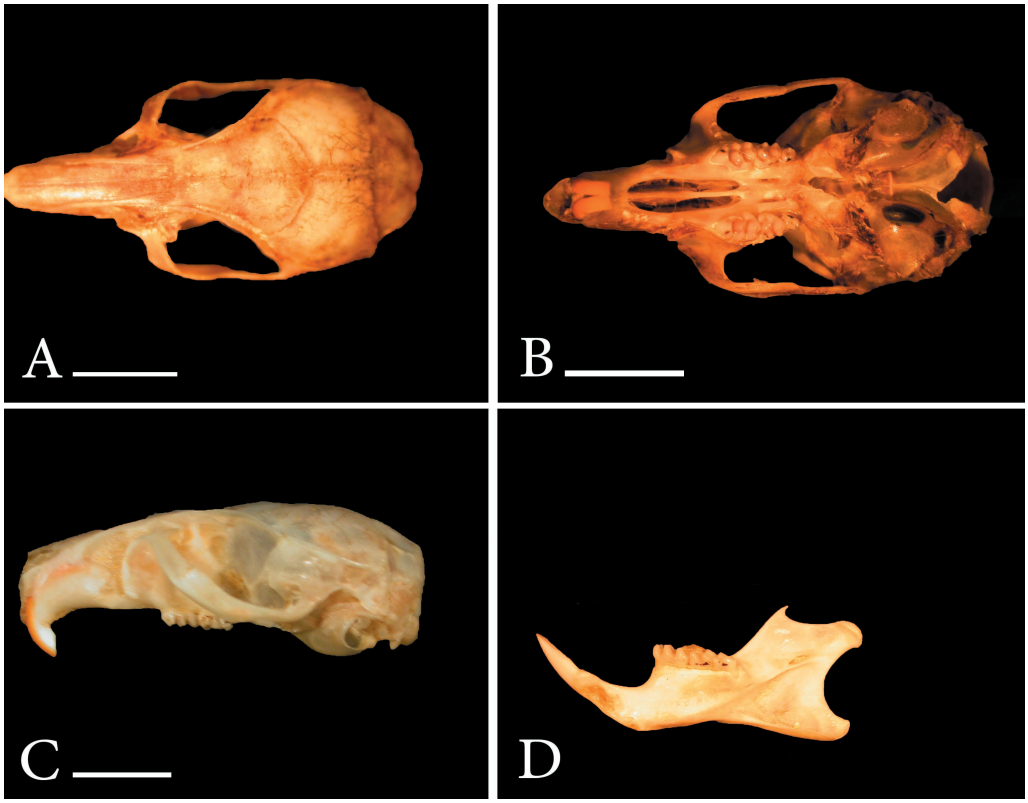


Fig. 7. Skull of *Acomys russatus lewisi* Atallah, 1967 (scale bar = 10 mm). A. Dorsal view. B. Ventral view. C. Lateral view. D. Lower jaw.

Table 5. Body measurements (in mm) of *Acomys russatus lewisi* Atallah, 1967

	♀♀ (n=5)			♂♂ (n=10)		
	min	max	M	min	max	M
TL	153	185	168.20	143	180	168.70
TaL	40	70	60.00	53	66	61.11
HF	17.2	21.5	18.60	16.0	22.0	18.46
EL	14.5	18.0	17.02	13.0	18.0	15.07
Wt	39.5	65.7	54.12	37.8	65.7	47.81

***Gerbillus dasyurus* (Wagner, 1842)**
(Fig. 8A)

Material examined. GCSAR1942, ♂, Karahta, 24 May 2010. GCSAR2044, ♂, Ain Arab, 14 June 2010. GCSAR2067, ♀, Sakra, 6 July 2010. GCSAR2068, ♂, Sakra, 6 July 2010. GCSAR2069, ♂, Sakra, 6 July 2010. GCSAR2070, ♀, Sakra, 6 July 2010. GCSAR2071, ♂, Sakra, 6 July 2010. GCSAR2072, ♀, Sakra, 6 July 2010. GCSAR2073, ♀, Sakra, 6 July 2010. GCSAR2074, ♂, Sakra, 6 July 2010.

Remarks. Reported from the vicinity of Aleppo and Deir Hajar (von Lehmann 1965). It was recently recorded from Lebanon (Abi-Said 2009).

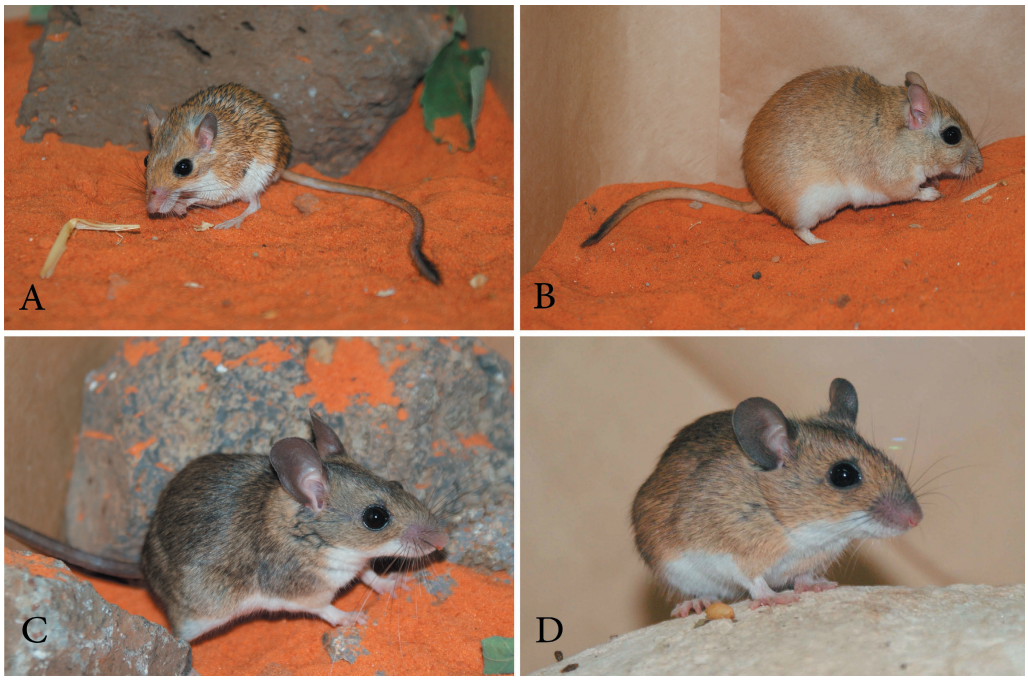


Fig. 8. A. *Gerbillus dasyurus* (Wagner, 1842) from Sakra. B. *Meriones tristrami* Thomas, Lichtenstein, 1823 from Ain Arab. C. *Apodemus mystacinus* (Danford et Alston, 1877) from Ain Arab. D. *Apodemus flavicollis* (Melchior, 1834) from Jubata Forest.

Table 6. External measurements (in mm) of *Meriones tristrami* Thomas, Lichtenstein, 1823

	sex	TL	TaL	HF	EL	Wt
GCSAR2006	♂	280	140	28.6	18.7	94.8
GCSAR2034	♂	250	110	28.7	19	70.4
GCSAR2035	♂	280	134	31.5	21	90.5

Meriones lybicus Lichtenstein, 1823

Material examined. GCSAR1800, ♂, Dumair, 18 August 2006.

Remarks. This species was recorded from several localities in Syria including Deir ez Zhor, Tall Abiad, Karyatien, Khan Abou Chamate, vicinity of Palmyra, 90 km east of Damascus along the highway to Palmyra, S An Nasiriyah, and near Al-Karyatien (Aharoni 1932, Misonne 1957, Harrison 1972, Kock 1998, Mamkhair et al. 2007). Further records based on owl pellets analysis were mentioned by Shehab et al. (2000, 2004).

Meriones libycus is the largest jird in Syria. Its black nails are considered unique external feature distinguishing this jird from the other species of the genus *Meriones* in Syria, where the nails of *M. crassus*, *M. tristrami* and *M. vinogradovi* are ivory white or pale. Mamkhair et al. (2007) gave an account on the distribution, cranial, phallus, glans penis and baculum morphology.

Meriones tristrami Thomas, 1892
(Fig. 8B)

Material examined. GCSAR2006, ♂, Ain Arab, 14 June 2010. GCSAR2034, 2035, 2 ♂♂, Ain Arab, 17 March 2010. Specimens recovered from owl pellets. 13 skulls, ex. *Tyto alba*, Khrab Al Shaham, 16 May 2000. 10 skulls, ex. *Tyto alba*, Mouzirib, 15 May 2000. 6 skulls, ex. *Tyto alba*, Kharabo, 19 April 2007.

Remarks. Tristram Jird was collected from the Mediterranean biotope of the study area. Localities indicated are either mountainous or open fields dominated by *terra rossa* soil. In Syria, Harrison & Bates (1991) indicated several localities along the coastal region reaching Aleppo based on previous reports. This is the largest jird in the southwestern Syria. Measurements for males (Table 6) are similar to those given by Mendelssohn and Yom-Tov (1999). Shehab (2005) reported that this species constituted 5.65% of the diet of the Barn Owl in southern Syria.

Apodemus flavicollis (Melchior, 1834)
(Fig. 8D)

Material examined. GCSAR1944, 1945, 2 ♂♂, Jubata Forest, 24 May 2010. GCSAR2092, ♂, Jubata Forest, 7 July 2010. GCSAR 2093, 2094, 2 ♀♀, Jubata Forest, 7 July 2010.

Table 7. Body measurements (in mm) of *Apodemus flavicollis* (Melchior, 1834)

	sex	TL	TaL	HF	EL	W
GCSAR1944	♂	195	100	20.0	11.0	25.3
GCSAR1945	♂	190	102	21.0	15.0	24.7
GCSAR2092	♂	172	86	21.0	17.0	23.6
GCSAR2093	♀	195	105	21.5	17.4	16.5
GCSAR2094	♀	173	78	21.0	18.5	26.6

Remarks. This is the first record to Syria. It was reported from Lebanon and Jordan (Harrison & Bates 1991, Abu Baker & Amr 2008). It prefers open areas within oak forests and it may also inhabit orchards, field margins, wooded gardens, hedgerows and buildings in rural areas (Amr 2012). Table 7 gives some external body measurements.

Apodemus mystacinus (Danford et Alston, 1877)
(Fig. 8C)

Material examined. GCSAR1805–1807, 3 ♂♂, Ain Arab, 18 August 2006. GCSAR1994, ♂, Ain Arab, 16 June 2010. GCSAR1995, ♀, Ain Arab, 16 June 2010. GCSAR1996, ♂, Ain Arab, 16 June 2010. GCSAR1997, 1999, 3 ♀♀, Ain Arab, 16 June 2010. GCSAR2000, 2001, ♂, Ain Arab, 16 June 2010. GCSAR2002, ♀, Ain Arab, 16 June 2010. GCSAR2003, ♂, Ain Arab, 16 June 2010. GCSAR2004, ♀, Al Bargasha, 3 June 2010. GCSAR2005, ♂, Al Bargasha, 24 May 2010. GCSAR2009, ♂, Sorghaya, 19 May 2010. GCSAR2016, 2017, 2 ♀♀, Sorghaya, 19 May 2010. GCSAR2018, 2019, 2 ♀♀, Ain Arab, 24 May 2010. GCSAR2036, ♀, Ain Arab, 17 May 2010. GCSAR2037, ♂, Ain Arab, 24 May 2010. GCSAR2038–2040, 3 ♀♀, Ain Arab, 24 May 2010. GCSAR 2041, 2042, 2 ♂♂, Ain Arab, 24 May 2010. GCSAR 2043, ♂, Ain Arab, 14 June 2010. GCSAR2045, ♂, Ain Arab, 24 May 2010. GCSAR2046, ♂, Ain Arab, 17 March 2010. GCSAR2047, ♀, Ain Arab, 17 March 2010. GCSAR2048–2050, 3 ♂♂, Ain Arab, 17 March 2010. GCSAR2058, ♀, Jubata Forest, 7 July 2010. GCSAR2059, ♂, Jubata Forest, 7 July 2010. GCSAR 2062–2064, 3 ♀♀, Jubata Forest, 7 July 2010. GCSAR 2065, ♂, Jubata Forest, 7 July 2010. GCSAR2066, ♀, Jubata Forest, 7 July 2010. GCSAR 2095, 2096, 2 ♂♂, Ain Arab, 4 Novmber 2010. GCSAR 2107**,** 2108, 2 ♀♀, Ain Arab, 4 November 2010. GCSAR 2109, ♂, Ain Arab, 4 November 2010.

Remarks. The Broad-toothed Field Mouse was reported from several localities in Syria, all in the western side (von Lehman 1965, Lewis et al. 1967, Atallah 1978). This species is associated with oak forested areas along the western mountains. All localities from which this species was collected are forested areas. Abu Baker & Amr (2008) gave a comprehensive treatment for this species in Jordan. Table 8 gives body measurements for *A. mystacinus*.

Table 8. Body measurements (in mm) of *Apodemus mystacinus* (Danford et Alston, 1877)

	♂♂ (n=23)			♀♀ (n=22)		
	min	max	M	min	max	M
TL	169	245	210.95	185	243	218.41
TaL	53	135	105.65	80	130	114.32
HF	22	29	24.27	22	26	23.61
EL	16	22	19.72	17	22	19.58
Wt	23.3	50.4	35.53	20.0	45.1	29.77

Mus musculus Linnaeus, 1758

Specimens recovered from owl pellets. 171 skulls, ex. *Tyto alba*, Kharabo**,** 25 June 200?. 16 skulls, ex. *Tyto alba*, Khrab Al Shaham*,* 16 May 2000. 46 skulls, ex. *Tyto alba*, Mouzirib*,* 15 July 2000. 34 skulls, ex. *Tyto alba*, Sorghaya, 3 April 2001. 60 skulls, ex. *Tyto alba*, Sorghaya, 15 June 2004. 68 skulls, ex. *Tyto alba*, Kharabo, 19 April 2007.

Remarks. This species is associated with agricultural areas in southern Syria. It was recovered from owl pellets in many parts of Syria (Shehab 2004, 2005, Shehab & Al Charabi 2006, Shehab et al. 2004).

Table 9. Body measurements (in mm) of *Rattus rattus* (Linnaeus, 1758)

	sex	TL	TaL	HF	EL	W
GCSAR1932	♂	275	165	32.0	22.0	40.8
GCSAR1988	♀	366	201	32.9	22.7	119.0
GCSAR2007	♂	325	175	31.0	21.0	80.6
GCSAR2032	♂	330	180	33.5	22.3	95.6
GCSAR2033	♂	320	175	31.0	22.0	78.8
GCSAR2113	♂	398	223	37.0	21.0	151.5

***Rattus rattus* (Linnaeus, 1758)**

Material examined. GCSAR1932, ♂, Al Bargasha, 3 June 2010. GCSAR1988, ♀, Al Bargasha, 24 May 2010. GCSAR2007, ♀, Al Bargasha, 27 May 2010. GCSAR2032, 2033, 2 ♂♂, Al Bargasha, 24 June 2010. GCSAR2113, ♂, Douma, 27 December 2010.
Specimens recovered from owl pellets. 33 skulls, ex. *Tyto alba*, Kharabo, 25 June 2008.

Remarks. This is a rather common species in urban and agricultural areas of Syria. Cranial remains were recovered from owl pellets from several locations in northern, southern and eastern Syria (Shehab 2004, 2005, Shehab & Al Charabi 2006, Shehab et al. 2004). Table 9 gives body measurements for *R. rattus*.

Family Spalacidae

Nannospalax ehrenbergi* (Nehring, *1898)

Specimens recovered from owl pellets. 3 skulls, ex. *Tyto alba*, Khrab Al Shaham, 16 May 2000. 1 skull, ex. *Tyto alba*, Dara'a Dam, 2 October 2004. 1 skull, ex. *Tyto alba*, Karahta, 19 February 2007.

Remarks. This species is confined to the Mediterranean and semi-Mediterranean biotopes of Syria. The distribution of the Middle East Blind Mole Rat is apparently associated with *terra rossa* soil. The taxonomic status of this species in Syria requires further investigation. It was recovered from owl pellets from northern, southern and eastern Syria (Shehab 2004, 2005, Shehab & Al Charabi 2006, Shehab et al. 2004).

Family Hystricidae

***Hystrix indica* Kerr, 1792**

Material examined. Rakhlah, no date. Wadi Behiran, E Arneh.

Remarks. The Indian Porcupine is under severe threats in Syria. Its meat is in demand among the locals. It is hunted by dogs in the vicinity of Mount Hermon. Its presence was recorded from Jabal Abdul Aziz near Aleppo (Harrison 1972) and Khneiz (Misonne 1957).

Family Myocastoridae

***Myocastor coypus* (Molina, 1782)**

Material examined. Mouzirib, 2014.

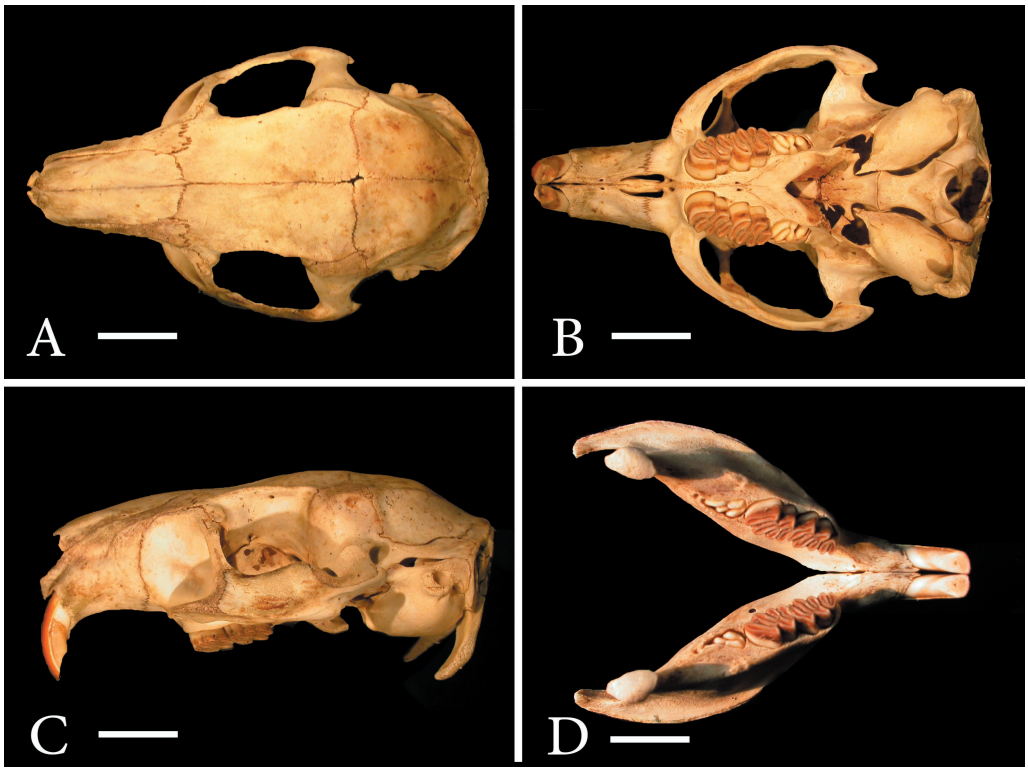


Fig. 9. Skull of *Myocastor coypus* (Molina, 1782) (scale bar = 10 mm). A. Dorsal view. B. Ventral view. C. Lateral view. D. Lower jaws.

Remarks. A colony of the Coypu was observed at Mouzirib, at the Yarmouk River. This is an invasive species introduced by Jewish fish farmers for fur production in the early 1950's from Chile (Bodenheimer 1958) and for economic reasons they were released in the River Jordan system. It lives in burrows alongside stretches of water. Currently, it is known along the Jordan and Yarmouk rivers (Khoury et al. 2012). Fig. 9 shows the skull of *M. coypus*.

DISCUSSION

This study adds three more species to the Syrian rodents. The distribution range of *Apodemus flavicollis* fits very well with its current distribution that extends from Europe reaching as far as northern Jordan (Abu Baker & Amr 2008). Also, *Acomys russatus lewisi* reaches its most northern range of distribution around the outskirts of Jabal Al Arab. Its distribution extends from the volcanic *Harra* in northern Saudi Arabia across the black lava desert of Jordan (Amr 2012). *Myocastor coypus* is an introduced species and is considered one of the worst invasive mammals (Lowe et al. 2000).

Species composition of rodents in southwestern Syria represents two patterns; those located near Mount Hermon are of Palearctic affinities (*Apodemus flavicollis*, *A. mystacinus*, *Chionomys*

nivalis, *Dryomys nitedula*, *Microtus guentheri*, *Nannospalax ehrenbergi*, and *Sciurus anomalus*), desert dwelling species to the east (*Allactaga euphratica* and *Jaculus jaculus*, and *Meriones lybicus*), and mesic species in the arid southwest (*Meriones tristrami* and *Gerbillus dasyrus*). Both *Rattus rattus* and *Mus musculus* are common around plantations and inhabited areas. Intensive agriculture is common southwestern Syria, with wheat fields as well as fruit trees.

Despite our extensive trapping in southwestern Syria, and particularly Tafas area, we were unable to trap or recover cranial remains in owl pellets for the mouse-like hamster, *Calomyscus bailwardi.* This species was trapped by Peshev & Al Hossein (1989) from Thafas (= Tafas). During this study remains of *Cricetulus migratorius cinerascens* and *Microtus guentheri* were recovered from Tafas. Additionally, Obuch & Krištín (2004) did not recover cranial remains from owl pellets for this species from around Rashid area near Jabal Al Arab. Peshev (1991) considered the Syrian population as the subspecies *Callomyscus bailwardi tsolovi.* Certainly, the viability of this relict population for this species requires further investigation.

A comprehensive study of the Syrian rodents is in need, especially along the coastal mountains and around the Euphrates to update our knowledge on the Syrian rodents.

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ANNEX

List of localities and their coordinates

	N	E
Ain Arab	32° 59’ 50.44”	36° 19’ 16.03”
Ain Dakar	32° 49’ 30.29”	36° 04’ 34.18”
Al Bargasha	32° 59’ 50.44”	36° 19’ 16.03”
Al Ghota	33° 31’ 27.66”	36° 24’ 09.26”
Al Mahbat	33° 17’ 38.30”	35° 57’ 03.27”
Al Shajara	32° 46’ 59.37”	35° 53’ 33.27”
Al Shiekh Mesken	32° 49’ 35.06”	36° 09’ 21.34”
Ashrafiat Al Wade	33° 35’ 14.34”	36° 11’ 36.57”
Bosra	32° 31’ 01.10”	36° 28’ 51.71”
Dara’a Dam	32° 36’ 03.99”	36° 06’ 48.99”
Darkhabieh	33° 38’ 01.73”	36° 09’ 57.85”
Douma	33° 34’ 16.40”	36° 24’ 46.65”
Dumair	33° 38’ 01.30”	36° 42’ 25.88”
Ebtaa	32° 47’ 29.58”	36° 09’ 08.41”
Jeleen	32° 45’ 21.09”	35° 59’ 38.61”
Jubata Forest	33° 14’ 01.31”	35° 49’ 19.71”
Jwileen Dam	32° 42’ 29.42”	36° 39’ 26.01”
Karahta	33° 25’ 10.71”	36° 30’ 05.01”
Kharabo	33° 30’ 00.00”	36° 27’ 00.00”
Khrab AL Shahem	32° 39’ 00.00”	36° 01’ 00.00”
Mahassa	34° 00’ 45.04”	37° 14’ 25.30”
Mouzirib	32° 42’ 44.01”	36° 01’ 34.55”
Najha	33° 23’ 02.43”	36° 22’ 41.71”
Rakhlah	33° 30′ 00.00″	35° 58’ 00.00”
Sakra	33° 10’ 09.12”	36° 27’ 17.00”
Sorghaya	33° 48’ 29.03”	36° 08’ 14.41”
Tafas	32° 44’ 50.56”	36° 04’ 33.78”
Tar Sali	32° 38’ 13.00”	36° 44’ 37.00”
Wadi Behiran	33° 22’ 18.28”	35° 52’ 37.52”